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ABSTRACT

This review of 81 research studies is primarily confined to the research on business education that concerns relationships between teaching acts and learning outcomes. Attention is directed to investigations that permit generalizations about the consequences for learning of specifiable instructional behaviors bearing on the materials and methods of instruction. Most of the research reviewed applies to office occupations, principally typewriting and stenographic skills, and some to retailing and distributive occupations. The findings of the researches cited are stated, and their implications for instruction are specified. (Author/JS)

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RESEARCH ON TEACHING BUSINESS AND COMMERCIAL SUBJECTS

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The term Business Education has several meanings. At collegiate levels the term refers, on the one hand, to preparation for professional careers in the broad area of business management or in the specializations that serve management (e.g., economics, statistics) and, on the other, to the preparation of teachers of business subjects, mainly for the secondary schools. In the junior or community college there has been increasing attention to individually owned small business operation, side by side with the traditional focus on specific vocational training for office, retailing, and services occupations. In the secondary schools the term covers specific preparation for office and retailing occupations, as well as "general education" objectives relating to business, consumer, and economic information and understandings applicable to all persons.

The office occupations embrace general clerical skills, typewriting and other office machines, stenographic and secretarial skills, bookkeeping and accounting, and the operation of data processing equipment. Retailing occupations run the gamut from wrapping packages and operating a cash register to the operation of an individually owned small business, the latter at community college rather than at high school levels.

The principal but not exclusive focus of this chapter is on relationships between teaching acts and learning outcomes. Attention is largely confined to investigations that permit generalizations about the consequences for learning of specifiable instructional behaviors bearing on the materials and methods of instruction. Reviews and syntheses of the entire spectrum of business education research are available elsewhere.[1]

The extent to which there exists in business education research a basis for description and analysis of pertinent patterns of teacher behavior varies with the several meanings or foci of business education given above. In the area of collegiate education for management, the overwhelming concern has been with objectives, rather than with means of achieving objectives. Two major foundation-supported studies (Gordon & Howell, 1959; Pierson, et al., 1959) have advocated an analytical treatment of subject

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[1]See the descriptive reviews of Lanham and Trytten (1966), covering 257 studies, and of Price and Hopkins (1970), covering 260 studies mostly completed during the 1966-68 period. More analytical and chiefly focused on instructional variables is the review by West (1969b), covering 111 investigations. Research bibliographies have been provided by Rahe for typewriting (1963) and for stenographic and secretarial skills (1965). Research bibliographies are also included in doctoral theses completed at Indiana University in bookkeeping and accounting (Devine, 1962), general business (Sluder, 1965), office practice (Prewitt, 1961), and economics (H. H. Green, 1964).

matter aimed at long-term preparation for management careers, while Gallagher (1963) is a representative spokesman for the more conventional focus on a descriptive treatment of subject matter aimed at immediate job preparation as proper for undergraduate collegiate education for business.

Equally little on patterns of teacher behavior is to be found in the business-teacher education literature. Studies of generalized teacher traits, as reviewed by Crunk (1959), and of credit and course allocations abound. Nineteen guidelines for the preparation of office-occupations teachers (Cook, 1966), representing a consensus among business education leaders, cover the major concerns but contain nothing that relates instructional acts to learning outcomes.

With hardly an exception, reliable information that could serve as a basis for identifying superior patterns of teacher behavior lies in studies that are task-specific, relating to the office and retailing skills and knowledges of the business curriculum.[2] Accordingly, the major instructional variables are treated on a subject-matter basis.

Concerning task-specific investigations, there is a substantial body of evidence for the typing task, somewhat less for stenographic skills, and not more than a few items for each of the other subject-matter or occupational areas within business education.[3] The larger body of behavioral information on typing and stenographic skills probably arises from their distinctiveness, as well as from their novelty. In contrast to the millenial concern with educational matters of universal interest, from Plato onward, the typewriter is an invention of the 1870's, and the shorthand system most widely used in this country (Gregg) dates from the 1890's. School training for business occupations is largely a 20th-century phenomenon. Given two entities (the typewriter and shorthand systems) without a long prior history in the schools, it is not surprising that they should have been thought to have distinctive characteristics, leading to the development of an edifice of training materials and methodological practices and to research on training variables pertinent to these tasks. Bookkeeping has about as long a large-scale school history as typewriting and shorthand, but seems not to have been perceived as having unique features calling for intensive methodological inquiries. The little that has been done in that and other lightly investigated business education areas will be treated in turn.

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[2]The business education research literature contains small numbers of studies of teacher-education techniques (e.g., microteaching), but the information provided is not unique to business-teacher education.

[3]General clerical skills (aside from typewriting) are not treated in the present chapter because the research in that area has no pertinence to patterns of teacher behavior. For the same reason, the general or social business subjects are also omitted.

Three General Phenomena

A number of phenomena broadly applicable across vocational business education deserve brief mention before attention is given to details on a task basis. First is the concern with the development of character and personality traits thought to be associated with obtaining and retaining a job. In that connection "the exhortation of hundreds of businessmen speakers at educational meetings over the preceding fifty years" (Lanham & Trytten, 1966, p. 57) are redundantly paralleled in the many surveys that report employer dissatisfaction with employees for reasons of deficiencies in conscientiousness, initiative, dependability, common sense, ability to follow directions--not to forget grooming, speech, courtesy, and language and arithmetic fundamentals. As an extreme instance, secretaries, executives, and secretarial teachers were reported to consider personal qualities more important for secretarial success than either fundamental or specialized skills and knowledges (Weber, 1969). To put such a finding in proper focus, one need only ask whether a person with exemplary character and personality traits, but who could not type, would be hired as a typist. Other studies (e.g., Cook & Lanham, 1966) report deficiencies in specific job skills, rather than in personal attributes, as the primary cause of dismissal from jobs among 16-21 year olds. The pertinent generalization refers to "the failure to find clear-cut relationships between personality . . . and occupational choice or success"--so that "our current knowledge of the role of personality . . . in work is impressionistic or, when quantitative, largely superficial" (Super & Crites, 1962, pp. 516-517). That characterization, the little that is known about how teachers might bring about the desired personal attributes in students, and the difficulties in the way of reliable assessment of personal attributes of students by teachers suggest that instructional attention should preferably be addressed to less recalcitrant objectives.

A second general phenomenon is the necessary sensitivity to occupational trends and forecasts and to the impact of technology on office occupations. The advent in recent years of data processing equipment has led to the establishment of training programs for data processing occupations in some high schools and in many 2-year colleges and proprietary schools. Bangs and Hillestad (1968) have estimated personnel needs in the field and the requirements for entry postions.

A third general phenomenon of recent years, common to many educational areas, is the development of instructional materials in programed form. Those cited in the canvasses of business education research (Lanham & Trytten, 1966; Price & Hopkins, 1970)--in the areas of shorthand, business mathematics, English fundamentals, business communications, economics, and bookkeeping and accounting--have been tested against conventional instruction. The usual, but not universal, finding has been of superiority for the programed materials. However, these studies do not, and were not intended to, provide useful generalizations about the controllable properties of that instructional medium. The extent to which the many commercially published programs are in routine use, as contrasted with those constructed by graduate students for thesis purposes, is not known.

Office Occupations

The most ambitious program of current research on training for office occupations is embodied in the NOBELS project (New Office and Business Education Learning Systems). NOBELS is an outgrowth of dissatisfaction with high school business education as "an aggregate of courses rather than a curriculum" (Lanham & Trytten, 1966, p. 26), rather than as integrated programs of learning. The project is self-described as a systems approach to curriculum analysis and modification, following the constructs of behaviorists (Lanham, Herschelmann, Weber, and Cook, 1970). The outcomes of the earlier stages of the NOBELS program are summarized in the report of the development of an inventory of 375 performance goals, derived from large-sample interviewing of office employees and their supervisors in large firms in metropolitan areas (Lanham, et al., 1970). The report makes apparent the inadequacy of job title as an indicator of job duties and organizes its goals in eleven functional categories (accounting, productior, sales, communications, et al.). The goal statements start with a "given" (e.g., "Given a request for credit information"), followed by a specification of the action taken, using one or more of 57 "action verbs" (e.g., the worker "compiles and delivers" the information to the requester). Statements of the kind quoted have some analogies with job analysis, but they have no psychological content and stop short of measures of employee proficiency at the various tasks covered by the performance goals. However, the investigators consider the performance goals to represent a marked improvement (in specificity) over what was formerly available and to provide a beginning basis for examination of current instructional materials and their modification when indicated. The next phases of that research program are aimed at selection from the goal inventory those pertinent to high school and community college training, the preparation of relevant learning experiences, their classroom trial, assessment of trial results, and modification based on results. It is at the stage of "preparation of learning experiences" that the opportunity exists to bring instruction into closer accord with a psychology of learning and teaching. Before that, the goals may have to be rewritten with greater behavioral specificity than is denoted by "action verbs" such as adjust, arrange, check, correct, proofread, etc. In some difficult instances (e.g., proofread), the mediating responses will have to be specified, as will means of bringing them under stimulus control, before an "effective learning experience" can be designed.

Typewriting

Typewriting instruction can conveniently be dichotomized into (a) the early stages devoted to stroking techniques, keyboard learning, and the development of ordinary copying skills and (b) subsequent attention to the application of stroking skills to realistic personal and vocational typing tasks (correspondence, tables, manuscripts, forms, and the like), "production typing," as it is called.

There have been three major treatments of learning to typewrite. The first was the pioneer investigation of Book (1908), wholly devoted to stroking skills and followed by his advice to teachers (1925) based on

his earlier study. Second was Typewriting Behavior (Dvorak, Merrick, Dealey, & Ford, 1936), a monumental treatise mostly devoted to ordinary stroking skills, based on a vast array of experimental evidence and the then existing psychology of skill. Third is Acquisition of Typewriting Skills (West, 1969a), an exhaustive treatment of typewriting learning, based on the experimental and correlational evidence to date, that analyzes and makes recommendations for instructional materials and procedures for copying skills and for production typing in the light of that evidence. In it, five major general principles are applied as yardsticks for evaluating instructional issues (reinforcement, contiguity, individual differences, transfer, and guidance versus confirmation techniques). Most of the particular studies mentioned below are discussed in West (1969a). On a narrower scale Lindsay, in a doctoral thesis (1966), has treated motor skill development in typewriting in the light of psychological concepts and theories, deducing three performance phases (familiarization and response orientation, refinement, fixation and automatization). Leonard and Newman (1965) also refer to the first two of those three phases in an inquiry into augmented feedback, and numerous human factors principles for keyboard design and operation are contained in a summary review prepared for the Post Office Department by Alden, Daniels, and Kanarick (1970).

Aptitude. In the light of Porter's estimate (1966) that 35 million Americans use the typewriter, it is clear that the typewriter has become even more an ordinary writing tool than a vocational device. This is not to minimize its vocational importance, however; 85 percent of all office positions that were not for the unskilled required typing skill as a prerequisite (Cook & Lanham, 1966). Fortunately for the sake of widespread diffusion of typewriter use in the population, and to some extent accounting for it, ordinary stroking or copying skill has been shown in dozens of studies to be virtually independent of measured intelligence. However, kinesthetic sensitivity might be an important predictor of stroking skills (Fleishman & Rich, 1963). For production typing, the evidence on relationships with intelligence (from a small number of studies summarized in West, 1969a) is ambiguous: the obtained correlations range between .10 and .50, the lower values reflecting restriction of range in one or both variables. Martin (1956) reviewed the literature on aptitude tests for typing, suggesting that a task as near as possible to the criterion task might have some predictive value; Flanagan, Fivars, and Tuska (1959) have developed a "tapping" test. It may be concluded from the available evidence that beginning typewriting should be available to all, but possibly not advanced training for higher-level vocational skills.

Copying Skills. Stroking techniques, concurrent with keyboard learning, precede instructional attention to building copying speed and accuracy. Despite the conventional reference to "touch" typewriting and the heavy insistence on nonvisual techniques from the start of learning, West (1967) has shown the unavailability of kinesthetic feedback to beginners and recommended large amounts of visual work at the start: as a source of feedback for responses in keyboard learning, for the sake of facilitating ballistic stroking in place of the pressing motions that often accompany early nonvisual work, and for its motivational and anxiety-reducing effects. Speed-forcing procedures that deny the learner the time to look

back and forth from his copy to his machine provide a response-competition condition that is recommended as the primary means of accomplishing the transition to nonvisual operation; finer details for accomplishing the transition remain to be worked out by teachers.

Findings about the extent of chaining of responses among typists support a general principle for practice materials for building copying skills: ordinary, unselected English prose over a wide vocabulary. It was originally supposed (Book, 1908, 1925) that there exists a hierarchy of stroking habits corresponding to language units (letters, syllables, words, phrases). The consequence for years was a heavy focus on contrived keyboard drills (for keyboard learning and perfecting of "letter" habits) and, even now, on a relatively narrow vocabulary of common words to be typed "on the word level" (for skill building). Later evidence (Fendrick, 1937; and an unpublished study summarized by West, 1969a, pp. 57-60) showed that up through the levels of skill commonly developed in school training (about 60 words per minute) much of the typing is still letter by letter and that chaining is largely restricted to a modest number of 2- and 3-letter sequences that have no necessary correspondence with syllables or words. A wide vocabulary of practice materials will contain the variety of letters and letter sequences in the language in their various positions in words and should thus be expected to have better transfer value than would a narrow vocabulary containing fewer letter sequences. H. H. Green (1932) early showed equal proficiency at a common-word vocabulary by those trained on a common-word vocabulary and by those trained largely on a low-frequency vocabulary.

Concerning keyboard presentation order (finger by finger, row by row, "skip around"), all orders are equally effective provided they quickly permit the typing of regular language, rather than nonsense, materials. With respect to rate of keyboard presentation, the typing textbooks vary between about five to about fifteen lessons (days) for the alphabet keys, although devoting two days per lesson and five to six weeks to alphabetic-keyboard presentation is not uncommon for so-called slow learners. The slow-but-sure rate of keyboard presentation is apparently based on the supposition that for the 26 letters of the alphabet, there are 26 responses to be learned. Consider, however, that the r of brush brings the left index finger over a different distance at a different angle than are involved in the r of from or cream or erase. There is not one r, but several r's; similarly for the other letters of the alphabet. Keyboard learning involves hundreds of responses (motion paths), not merely twenty-six, and the variety of motion paths should make apparent that the letter sequence, not the single stroke, is the proper focus of attention. The sooner the keyboard is presented, the sooner the use of the wide vocabulary containing the letter sequences of the language and the motion paths that go with them.

Keyboard presentation accomplished, in whatever number of lessons, the subsequent attention to building copying speed and accuracy is based on the uniform finding in numerous studies (reviewed by West, 1969a, p. 238) of an essentially zero correlation between speed and accuracy among students at all stages of training. With the low correlation suggesting

that the two features of performance are based on different underlying factors, speed practice at forced rates is commonly conducted with tolerant error limits; separate practice is given to accuracy, preferably in the form of typing at comfortable rates. The effects of speed-accuracy programs depend on the amount and distribution of practice toward each objective, on the degree of emphasis (how fast? how accurate?), and on the extent to which practice goals are individualized. Accuracy practice has also commonly invoked a torrent of specially contrived practice materials that focus on specified types of motion sequences. These have never been shown to have the desired effects, nor have "rhythm drills." Accuracy is not a function of materials or of equal interresponse intervals, but of stroking at a comfortable speed.

External pacing of responses--at comfortable rates for the sake of accuracy and at uncomfortably high rates for the sake of the contiguity conditions that lead to chaining of responses and higher speeds--should theoretically be expected to have the desired effects. However, the several investigations of external pacing of responses (reviewed by Lanham and Trytten, 1966; Price and Hopkins, 1970; and discussed in more detail by West, 1969a) have had varying outcomes. It seems probable that the effects of external pacing depend heavily on such variables as distribution of paced speed and accuracy practice, individualization of practice goals and pacing rates, and temperamental resistance to imposed response rates on the part of some. The pacing, incidentally, is not metronomic, not stroke by stroke, with equal time intervals between strokes. That hallowed concept of typewriting rhythm (Book, 1908) was long ago shown to be wrong (Coover, 1923; Harding, 1933). Instead, easy stroking sequences (e.g., th) involve short latencies, while more difficult sequences (e.g., az) require longer interresponse times. Accordingly, in recent years pacing materials and devices have been designed and engineered for line-by-line pacing units or by quarter-minutes. Stroke-by-stroke pacing is confined to the earliest stages of learning and is handsomely implemented, using audio-visual techniques, in the electronic display panels for keyboard learning used in some proprietary school training (see the July 1969 issue of The Office, the June 1967 issue of Personnel Management, and the June 15, 1964 issue of Steel for examples).

A final issue on copying skills relates to the virtual dogma about repetitious practice. Curiously, only one small scale study (Temple, 1963) has been directly addressed to the question, finding no advantages to it in contrast to nonrepetitious practice over a more varied body of materials. For speed-building routines that consist of repeating a piece of copy until it is completed in a given time, before attempting a new piece of copy that sets a slightly higher speed goal, there is no alternative to repetitious practice. For untimed activities, on the other hand, there would seem to be little merit in the typical "type each word (or line) two (or three) times" tactics. This is because the pertinent response units for typing are the letter and the letter sequence. Since letters and letter sequences appear and reappear in various positions in a wide vocabulary of words, nonrepetitive practice at varied materials should be expected to have better effects than repetitious practice narrowly confined to the letters and letter sequences of a smaller practice vocabulary.

Production Typing. Conventional instruction focuses largely on copying skills, especially on stroking accuracy, for up through the first semester of instruction, with periodic attention to such skills thereafter. The supposition has been that copying skills are an important contributor to proficiency at realistic personal and vocational typing tasks. The evidence (Muhich, 1967; West, 1969a, Chap. 13) demonstrates, instead, that among trainees with up to 2+ years of instruction, decision-making about the placement of materials on the page (e.g., margins, table arrangement) plays a larger role in production proficiency than does stroking skill, increasingly so as amount of training increases. Copying speed has a moderate correlation with speed at production tasks, whereas copying accuracy is only trivially related to production accuracy. Apparently, the typist's "set" for production typing differs from his perception of the copying task; accordingly, his stroking habits differ. Production typing errors are greatly below copying errors, and typists at all levels of copying accuracy are found at all levels of production accuracy. Less attention to copying skills and earlier attention to production tasks and to the placement features of such tasks before executing them at the typewriter appear to be desirable.

For production typing training, the established generalization about guidance or "show how" versus confirmation techniques (Bugelski, 1956; Stolurow, 1959) is applicable: guidance is valuable if provided in small doses confined to the early stages of instruction; in large amounts or too long continued, it is harmful. In contravention of that principle current typewriting textbooks provide the learner with page-placement information (e.g., location of the date line in a business letter, side margins and tabular stops in a table) even at late stages of training. Other changes in the production typing materials of selected typing textbooks that would bring them into better accord with the work of newly employed typists have been identified by Wise (1968): decreases in business letters, increases in tables and in numbers, and a wider spread of vocabulary.

A number of studies (e.g., Hill, 1957; Crawford, 1956) support the various inferences drawn here, and there is no contrary experimental evidence. Even so, conventional practices too often rely on the opinions of teachers, solicited via questionnaire (Robinson, 1967b). As one might expect, the experimental evidence sometimes shows these opinions to be correct, at other times wrong.

Measurement of Proficiency. Copying skills are measured by "straight copy" tests--the line-for-line copying of perfectly printed prose, without error correction, usually for five minutes. These tests are scored for speed (words per minute) and for number of errors or, more commonly, by a composite score involving subtracting a penalty for errors from the speed score. Gross speed scores show high reliability (routinely in the .80's and .90's) even over long intertest intervals, whereas error reliabilities rarely exceed the .30's to .40's (West, 1969a, p. 296). Composite scores inevitably have intermediate levels of reliability (West & McLean, 1968). These data on score reliability, together with the earlier mentioned finding of low relationships between copying accuracy and pro-

duction typing accuracy, argue for separate speed and error scoring and for giving more weight to copying speed than to copying errors.

Once stroking speeds of about 20-25 words per minute have been attained--not before--the vocabulary of the straight copy materials influences stroking speed, but not accuracy (Robinson, 1967a; and a number of studies summarized in West, 1969a, pp. 528-536). Copy difficulty is expressed in measures of syllabic intensity (mean number of speech syllables per dictionary word), stroke intensity (mean number of typewriter strokes per dictionary word, including punctuation and spacing), and percentage of common words (within the 1,000 most common words). Although it has for years been assumed that 1.40 represents mean syllable intensity and 5.0 mean stroke intensity--with practice and test materials constructed accordingly--a reputable vocabulary of written business communication (Silverthorn, 1955) was found to have a weighted-for-frequency mean syllabic intensity of 1.54 and a mean stroke intensity of 6.0 (West, 1968). Despite the conventional underestimates of copy difficulty, copying tests have such a long history that well established proficiency standards exist, as reflected, for example, in Civil Service typing tests.

The scanting of production typing in favor of copying skills has led to the virtual absence of national standards and norms for the genuine objectives of instruction. Normative data are confined to commercially published tests, as given in the series of Mental Measurements Yearbooks (Buros, editor), none of which has been administered to samples of examinees sufficient for national extrapolation. However, a pioneer attempt to provide indices of production task difficulty (McLean, 1971), as a necessary precondition for interpretable norms and standards, is a promising development.

Stenographic Skills

A brief description of stenographic skills in stimulus-response terms has been supplied by West (1963). Dickinson (1966) examined methodological practices in stenographic instruction (e.g., Leslie, 1953) in the light of the writings of learning theorists, finding numerous practices to be without theoretical support. Research findings on several major instructional issues will be detailed following discussion of aptitudes and of shorthand system characteristics in relation to stenographic requirements.

Aptitude. Instruction in the two major symbolic systems of shorthand taught in this country (Gregg and Pitman) has characteristically been accompanied by failure rates approximating 30 percent (Frink, 1961). During the years when stenographic instruction in the high schools was typically for two years, only 40 percent of first-year enrollees took a second year of shorthand (Wright, 1965). Business teachers have continually complained that the business subjects have been made a "dumping ground" for low-ability, nonacademic students. For stenographic training the complaint is justified. There seems to have been little awareness among educational administrators that stenographic skills are on a par with the more difficult academic subjects in their demands on intelligence, showing correlations, in numerous studies, of .50 to .60 with measured IQ (Frink, 1961). These demands are created not only by a complex

system of symbolic notation, but also by the requirement of high verbal skills (vocabulary, spelling, punctuation, word division, "word sense," etc.) for the correct transcription of shorthand outlines on the typewriter.[4] The problem of attrition has been aggravated by the trend in recent years toward reduction of stenographic training in the high schools to one year, often followed, however, by up to a full year of "secretarial practice," partly devoted to stenographic skills per se. In one study whose findings may well be typical of general experience (Smith, 1966), one year of training was not found to be enough for attaining the traditional minimum standard of a shorthand writing speed of 80 words per minute (wpm). Numerous simpler, largely nonsymbolic shorthand systems have been developed, and some of them have been compared to Gregg shorthand in their effects on stenographic proficiency, sometimes under less than ideal experimental conditions. Lanham and Trytten (1966) are not optimistic about the fruitfulness of comparative studies and suspect that, whatever their outcomes, there is little hope of dislodging the more difficult symbolic systems.

In any event, an IQ below 110 appears to promise less than a 50-50 chance of success in stenographic training (Freiberg, 1968): grade point average and grades in selected English courses are also pertinent predictors; the variables judged to underlie stenographic skills are represented in a number of validated prognostic tests reviewed in the various editions of The Mental Measurements Yearbooks. By whatever method, the screening of applicants for stenographic training is clearly desirable.

Stenographic Requirements and Shorthand System Characteristics. One avenue toward the reduction of attrition, besides the development of nonsymbolic systems, has been the reduction of system complexities in Gregg shorthand. The changes have been in the direction of making that system more fully phonetic and of eliminating some shorthand theory rules found to have been confusing. However, Iannizzi's (1967) finding of no differences in dictation or transcription error rates as between learners of the 1949 and 1963 revisions of Gregg shorthand would appear to call into question the sufficiency of the system changes. Even so, the greater importance of variables external to the shorthand system is suggested by Iannizzi's finding that more than 80 percent of incorrectly written outlines were correctly transcribed, while more than half the transcript errors were from correctly written notes. Comparable results were found in studies by Lusk (1959) and Frye (1965). What might be called "word sense" (size of vocabulary and the ability to infer missing words or to interpret poorly written shorthand outlines from contextual clues) is probably the dominating factor, as shown by the findings of Hillestad (1960) and Uthe (1966) that the vocabulary level of the dictated materials, not shorthand system characteristics, were highly correlated with

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[4] An "outline" is a shorthand word or phrase written without lifting the pen, "Transcription" refers to the conversion of the dictated shorthand notes (outlines) into standard English orthography on the typewriter.

errors in the shorthand notes. The generality of poorly written shorthand is reflected in the finding that about 18 percent of the shorthand outlines written from 80 wpm dictation by those completing two years of high school Gregg shorthand training were incorrect (Hillestad, 1960). The findings on errors in the typed transcript of Farmer (1961) for Pitman shorthand and of Baggett (1964) confirm the preeminence of verbal over shorthand-system skills.

Nonetheless, system features that reduce the demand on verbal skills cannot but be helpful. Analysis of Gregg and Pitman shorthand reveals numerous instances of unwanted stimulus generalization and response generalization, of convergent and divergent associations--rather than one-to-one relationships between sound and symbol. Probably, these difficulties are mostly unavoidable in complex symbolic systems capable of sustaining court reporting speeds of 200+ wpm. Only the simpler, nonsymbolic systems, with their greatly lower speed ceilings, are mostly free of such complexities. Moreover, the better nonsymbolic systems are no doubt adequate for some stenographic positions, as suggested by the dictation speeds found among employers (H. H. Green, 1950).

Instructional Variables. Attention is confined here to those variables that are exclusively stenographic: the encoding process of taking dictation in a symbolic shorthand system and the decoding process that mediates transcription of shorthand notes on the typewriter. Teachers necessarily give much attention to spelling, punctuation, word division, letter style, and other verbal skills. But these latter features characterize all writing; they are not unique to the stenographic act.

Several of the leading issues in shorthand instruction are well represented in the several global "approaches" to shorthand learning, each comprised of many variables. The features of these various approaches have been summarized by Russon (1968), together with their purported advantages and disadvantages, based on the personal judgment of the summarizer. The issues are:

1. Writing of shorthand at the outset versus devoting at least several weeks to reading of perfectly written textbook shorthand before writing is begun.

2. Deliberate teaching of the theory or rules of the shorthand system (and frequent testing for knowledge of theory) versus reading and copying of perfect textbook shorthand, without whys and wherefores, as a basis for taking dictation.

3. Early versus late introduction of new-matter dictation. "New matter" refers to materials not earlier practiced as such, that may or may not contain at least a few individual words the learner may never before have read or written in shorthand.

4. Early versus late introduction of transcription of shorthand notes on the typewriter.

Not a feature of the various global approaches, but important, is:

5. Extensive drill on the most common words in the language versus practice at them proportional to their frequency of occurrence in the language.

There are, of course, many ancillary issues--e.g., spread of vocabulary in the training materials, optimum dictation rates and of increments in dictation rates for repetitive practice purposes, and so on.[5] Because dependable research evidence is in short supply on some issues, derivation of desirable patterns of teacher behavior sometimes requires recourse to inferences from the principles of a psychology of learning.

Concerning early writing versus reading, recognition is easier than reproduction; reading shorthand is simpler than writing it. How much reading might profitably precede writing is an empirical question not yet satisfactorily answered. Although practitioners do not put the issue in such terms, reading furnishes mediators for writing. Accordingly, it is common early instructional practice in Gregg shorthand to have learners vocalize the component sounds represented in a shorthand outline while looking at it (e.g., s-a, say; s-e-d, said). When "say" is later dictated by the teacher, the learner can spell its two component sounds to himself as he writes its two corresponding parts in shorthand. Pitman shorthand does not easily lend itself to vocalization techniques because, in it, vowels are inferred rather than directly represented.

Concerning focus on shorthand rules, since none of the leading symbolic systems of shorthand is fully phonetic, with undeviating one-for-one correspondence of sound to symbol, numerous shorthand outlines require adherence to a specified rule if they are to be correctly written. In early years there was much recitation of rules. In more recent years the issue has become one of whether accurate transcripts depend on correctly written shorthand and that, in turn, on an instructional focus on shorthand theory leading to technical correctness of outlines, as measured by frequent word-list tests.[6] The findings discussed earlier of much incorrect transcrip-

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[5]See Frink (1961), Lanham and Trytten (1966), and Price and Hopkins (1970) for the spectrum of research on stenographic and secretarial skills. The present discussion is mostly confined to the five major issues itemized above.

[6]The typical word-list tests do not test knowledge of shorthand theory because they tend to consist of words and phrases earlier subjected to heavy practice. A proper test of theory knowledge requires the application of system rules to new words. Another objection is that the word-list tests are typically dictated and the outlines are later transcribed, thus confounding two other variables (writing speed and shorthand reading) with theory knowledge.

tion of correct outlines and much correct transcription of incorrect outlines would seem to deny an important role to knowledge of shorhand theory and to technical correctness of shorthand outlines. Still, dealing with the issue on its own terms, one inquiry (Pullis, 1966) showed positive correlations between word-list scores on the one hand and, on the other, dictation and transcription scores, as did Danielson (1959) between word-list scores and dictation rates. However, the conditions of word-list testing and of dictation-transcription testing are vastly different, and there is nothing whatever to show that correct shorthand in word-list tests was accompanied by correct shorthand in the dictation tests. Besides, the three phenomena (word lists, dictation, transcription) have no evident causal interrelation; instead, they are probably all related to a third thing, general intelligence. The role of knowledge of shorthand theory and, in turn, of correct shorthand, in relation to the criterion of accurate transcripts must be characterized as uncertain. The best that can be suggested is that correct shorthand is preferred to incorrect shorthand and that immediate feedback via prompt checking of outlines written under dictation conditions against model shorthand may be the most effective and economical way to handle the matter.

Concerning early versus late new-matter dictation, in the several studies "late" was taken to mean after completion of system theory, usually some time during the second semester of instruction. Neither Persing (1966) or Baird (1967) or McKenna (1966), in a study that combined introduction of new-matter dictation with other variables, could find advantages for it in relation to deferred new-matter dictation. However, these studies were not very explicit in detailing the tactics that accompanied new-matter dictation. The incidence of words never written before is not given, nor is it determinable whether immediate feedback for the correctness of outlines was given. Insofar as much incorrect shorthand seems to follow whether or not shorthand theory is stressed, and insofar as the potential vocabulary of occupational use of shorthand greatly exceeds the spread of vocabulary contained in standard instructional materials, there would seem to be no option but to give students substantial amounts of practice in contructing new outlines under the press of dictation. As between automatizing a high-frequency vocabulary and acquiring a method of coping with new outlines under dictation conditions. Hillestad's finding (1960) of a 2.6 percent error rate on the very high frequency words represented by the arbitrarily abbreviated "brief forms" of Gregg shorthand, in contrast to a 15.6 percent error rate on all other words, lends force to the recommendation made here. Prince (1967) found intensive drill on the 500 most used words to lead to better transcription performance on those words and on other words than the nonuse of intensive drills. However, a more pertinent contrast would be between such drills and an equal amount of time devoted to new-matter dictation over a varied vocabulary deliberately including a reasonable number of words never earlier practiced.

The conventional deferring of typewritten transcription of dictated notes until relatively late stages of training has led to disappointing transcription speeds. No unconfounded test of early transcription has been conducted. However, Condon (1945), in combining early transcrip-

tion with other features, found the combination to be generally superior to a combination of more conventional instructional procedures that did not include early transcription. There is no apparent reason why plentiful practice at the criterion task of transcribing one's dictated notes at the typewriter should not be furnished. To do so, it must be begun rather earlier than is typical.

Conventional instruction may be generally characterized as one that focuses on a high-frequency vocabulary, that continues guidance into late stages of training (e.g., "previewing" of selected outlines prior to dictation), and that defers practice at the criterion task until relatively late stages of training. The unimpressive consequences of such tactics suggest that they be reversed, and appropriately designed studies bearing on reversed tactics are desirable.

Measurement of Proficiency. There are, in principle, three criteria of stenographic proficiency: shorthand writing rate, transcription speed, and transcript quality or accuracy. In practice, evaluation of terminal proficiency in high school training has tended to consist solely of a minimum requirement of 95 percent accuracy in transcribing business letter materials dictated at 80 wpm. It is not common practice to test at a variety of dictation speeds and to grade, in part, on the basis of the dictation speed whose notes can be acceptably transcribed. At least there are no distributions of terminal dictation speeds in the research literature. Similarly, since it is not common practice to time the transcript, no transcription speed standards exist. However, one fairly large-scale, but old, study (Wanous, 1940) found a median transcription speed in California high schools after two years of training of 14 wpm. Possibly, the mechanics of test administration conditions that measure all three criteria are too burdensome for teachers. Also, no one has worked out a scoring scheme and a means of weighting the three criteria to arrive at an overall assessment of demonstrated reliability and validity, let alone one whose arithmetic teachers might consider feasible. The measurement of stenographic proficiency remains an important area for research.

The difficulty of test materials has been exclusively controlled in terms of syllabic intensity, with 1.40 assumed to represent average difficulty. Dictation is based on "standard" words; 80 wpm means 112 speech syllables per minute (80 x 1.40), not 80 dictionary words. Aside from the fact that 1.54 is the true mean syllabic intensity for a vocabulary of 11,055 different words of written business communication--so that 80 wpm means 123, not 112, syllables per minute--it was also found that syllabic intensity is virtually uncorrelated ($r = -.11$) with word frequency (West, 1968). That finding--and Hillestad's comparable one (1960)--demonstrate that percentage of words in the dictation within the 1,500 or 2,000 most common words is a necessary additional index of the difficulty of dictation materials. The conventional 1.40 syllabic intensity index underestimates true average difficulty, overestimates student proficiency, and is additionally weak when unaccompanied by the index of percentage of common words in the materials.

Bookkeeping and Data Processing

Devine's (1962) descriptive compendium of the bookkeeping and accounting research is virtually devoid of inquiries bearing on patterns of teacher behavior. He found the "balance sheet" approach to be more popular than the "journal" approach--the bird's eye view to the worm's eye view; "practice sets" are popular, but the evidence on the merits of working through an entire bookkeeping cycle, in contrast to piecemeal activities, is ambiguous. The large-scale NOBELS survey concluded that "the functional classification of accounting and computing might well have been relabeled numerical data handling . . . The number of tasks collected requiring application of 'principles of accounting' as taught in schools or 'double entry bookkeeping' as a system of financial transaction analyses was minimal" (Lanham, et al., 1970, p. 27). Spanswick (1967) found that employers considered the 1-year bookkeeping training that predominates in the high schools to be inadequate for initial employment in manual bookkeeping positions and its content unrealistic. On the other hand, Fairbank (1967), on the basis of a 36 percent response to a mailed questionnaire survey of former bookkeeping students in New York State, found them to consider their training useful, although some instructional content of low present job utility was identified. Except for the small office in which the bookkeeper does other things as well, manual bookkeeping is expected to be heavily hit by electronic data processing techniques (Diebold, 1963).

Inquiries into data processing are exemplified in a national survey of data processing managers (Bangs & Hillestad, 1968), which found that beginning positions in computer installations are available to high school graduates in the majority of operator and clerical classifications (e.g., keypunch operator, unit records operator, tape librarian, computer operator). The community college is the locus for training as programmer and other higher-level positions. For entry positions, on-the-job training is often available, and selection tests for operators are often used (Carter, 1965).

Retailing and Distributive Occupations

As with data processing occupations, the research has not been aimed at instructional variables. Among workers in distributive occupations who did and did not receive formal high school training for such occupations, small and probably not significant differences were found between the two groups in their self-reported judgments of the extent to which their jobs required or involved knowledge and experience, judgment, initiative and ingenuity, supervisory activities, and responsibility for sales volume (Mason, 1961). Entry positions in retailing occupations appear to have no apparent prerequisites other than high school graduation (Cook & Lanham, 1966). The community college has increasingly become the locus for higher-level programs aimed at middle management and individually owned small-business operation. For small-business operation, the educational research has tended to be oriented toward traits and generalized abilities: communications skills, human relations sensitivity, thinking ability, technical knowledge, and drive (Pickle, 1964).

Kunsemiller (1961) interviewed and tested independent retail store owners in 66 California cities and concluded that the qualities that distinguish successful from unsuccessful owners are analytic ability, discriminating thinking, problem solving, and decision making. The same qualities no doubt apply to success in hundreds of occupations.

Status of Research

Lanham and Trytten (1966) have pointed out that the research in business education "has been almost exclusively produced by graduate students, motivated by degree requirements [p. 95]," as amply attested to by the research listings in the spring issues of The National Business Education Quarterly.[7] The Quarterly, however, tends to confine its listings to theses and dissertations, as furnished by department chairmen in institutions that grant graduate degrees. In these listings master's theses greatly outnumber doctoral dissertations, and questionnaire studies that solicit opinions and judgments or that determine current status vastly outnumber experimental studies of the effects of instructional behaviors on student achievement. Although the productions of graduate students have displayed more statistical sophistication in recent years, much of their research suffers from the theoretical naivete of which Wallen and Travers (1966) complain. Little of the business education research reveals an understanding, on a nonsuperficial level, of the findings of a psychology of learning.

In recent years federal funding has made it possible to mount more ambitious research enterprises, under more sophisticated direction. It remains to be seen what impact these efforts will have on the instructional behavior of practicing teachers and on teacher-education programs.

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[7]As of 1971, abstracts of selected research studies, formerly regularly published in the Quarterly, appear in the Business Education Forum (National Business Education Association, Washington, D. C.).

References

Alden, D. G., Daniels, R. W., & Kanarick, A. F., Human factors principles for keyboard design and operation--a summary review. Washington, D. C.: Post Office Department, Bureau of Research and Engineering, 1970.

Baggett, H. W., Jr. The validity of a measure of the difficulty of Gregg shorthand dictation materials. Doctoral dissertation, University of Minnesota, 1964. University Microfilms No. 64,9471.

Baird, S. J. The effectiveness of introducing regular dictation of unpracticed materials before the completion of Gregg shorthand theory. Doctoral dissertation, Oregon State University, 1967. University Microfilms No. 67-9681.

Bangs, F. K., & Hillestad, M. C. Curricular implications of automated data processing for educational institutions. Boulder: University of Colorado, 1968.

Book. W. F. The psychology of skill. Missoula, Mont.: University of Montana Studies in Psychology, Vol. 1, 1908. [Republished in 1925 by McGraw-Hill.]

Book, W. F. Learning to typewrite. New York: McGraw-Hill, 1925.

Bugelski, B. R. The psychology of learning. New York: Holt, Rinehart & Winston, 1956.

Carter, D. M. A study of office training programs for data processing personnel in selected businesses in metropolitan Denver, Colorado, with implications for business education in the secondary schools. Doctoral dissertation, State University of Iowa, 1965. University Microfilms No. 65-11601.

Condon, A. A comparative study of the transcription and functional methods of teaching elementary shorthand. Unpublished doctoral dissertation, New York University, 1945.

Cook, F. S. Office and business education teacher training clinics. Wayne State University, 1966. Project No. 6-1522-1-32, U. S. Office of Education.

Cook. F. S., & Lanham, F. W. Opportunities and requirements for initial employment of school leavers with emphasis on office and retail jobs. Project No. 2378, U. S. Office of Education, 1966.

Coover, J. E. A method of teaching typewriting based on a psychological analysis of expert typing. National Education Association, Addresses and Proceedings, 1923, 61, 561-567.

Crawford, T. J. The effect of emphasizing production typewriting contrasted with speed typewriting in developing production typewriting ability. Monograph 97. Cincinnati: South-Western Publishing Co., 1960.

Crunk, D. E. Guiding the teacher-trainee's development of the qualifications of an effective teacher--with special application to the business teacher. Doctoral dissertation, Indiana University, 1960. University Microfilms No. 60-1263.

Danielson, H. The relationship between competency in shorthand vocabulary and achievement in shorthand dictation. Doctoral dissertation, Indiana University, 1960. University Microfilms No. 59-6593.

Devine, J. W. A comprehensive analysis, classification, and synthesis of research findings and thought on the teaching of bookkeeping and accounting. Doctoral dissertation, Indiana University, 1963. University Microfilms No. 63,3816.

Dickinson, J. A. The role of practice in shorthand skill development as related to selected classical theories of learning. Doctoral dissertation, University of Oklahoma, 1966. University Microfilms No. 66-14,205.

Diebold, J. When will your husband be obsolete? McCall's, 1963, 90, 64-65, 118-119.

Dvorak, A., Merrick, N. L., Dealey, W. L., & Ford, G. C. Typewriting behavior. New York: American Book, 1936.

Fairbank, R. E. A follow-up of New York State high school bookkeeping students. Albany: State Education Department, Bureau of Occupational Education Research, 1967.

Farmer, G. M. An experiment to test the validity of a measure of the difficulty of shorthand dictation materials. Doctoral dissertation, University of Minnesota, 1962. University Microfilms No. 62,1777.

Fendrick, P. Hierarchical skills in typewriting. Journal of Educational Psychology, 1937, 28, 609-620.

Flanagan, J. C., Fivars, G., & Tuska, S. A. Predicting success in typing and keyboard operation. Personnel and Guidance Journal, 1959, 37, 353-357.

Fleishman, E. A., & Rich, S. Role of kinesthetic and spatial-visual abilities in perceptual-motor learning. Journal of Experimental Psychology, 1963, 66, 6-11.

Freiberg, F. A. A study to determine the validity of administering a stenographic aptitude test at Medford High School. Unpublished master's thesis, Wisconsin State University (Eau Claire), 1968.

Frink, I. A comprehensive analysis and synthesis of research and thought pertaining to shorthand and transcription. Doctoral dissertation, Indiana University, 1961. University Microfilms No. 61,3206.

Frye, C. F. An error analysis of dictation notes of second-semester high school students of Gregg Shorthand Simplified. Unpublished master's thesis, University of Tennessee, 1965.

Gallagher, B. G. One president's views on schools of business. Collegiate News and Views (South-Western Pub. Co.), 1963, 16(3), 1-6.

Gordon, R. A., & Howell, J. E. Higher education for business. New York: Columbia University Press, 1959.

Green, G. G. Teaching of economics: A comprehensive analysis and synthesis of research findings and thought. Doctoral dissertation, Indiana University, 1965. University Microfilms No. 65-2371.

Green, H. H. The relative effectiveness of the thousand commonest words in the teaching of typewriting. University of Iowa Monographs in Education, Research Studies in Commercial Education, 1932, 5, 167-178.

Green, H. H. The nature of business dictation. Unpublished doctoral dissertation, University of Pittsburgh, 1950.

Harding, D. W. Rhythmization and speed of work. British Journal of Psychology, 1933, 23, 262-278.

Hill, D. J. A study of the effects of drill upon typewriting. Unpublished master's thesis, University of Michigan, 1957.

Hillestad, M. Factors which contribute to the difficulty of shorthand dictation materials. Doctoral dissertation, University of Minnesota, 1961. University Microfilms No. 61,567.

Iannizzi, E. Transcription and shorthand errors among elementary and advanced high school writers of Simplified and Diamond Jubilee Gregg shorthand. Doctoral dissertation, New York University, 1967. University Microfilms No. 67-1107.

Kunsemiller, C. F. Recognized educational needs of independent retail store owners in selected cities in California. Doctoral dissertation, University of Southern California, 1961. University Microfilms No. 61-6293.

Lanham, F. W., Herschelmann, K. M., Weber, C. P., & Cook, F. S. Development of performance goals for a new office and business education learnings system (NOBELS). Project No. 8-0414. U. S. Office of Education, Bureau of Research, 1970.

Lanham, F. W., & Trytten, J. M. Review and synthesis of research in business and office occupations education. Columbus, O.: Ohio State University, Center for Research and Leadership Development in Vocational and Technical Education, 1966.

Leonard, J. A. & Newman, R. C. On the acquisition and maintenance of high speed and accuracy in a keyboard task. Ergonomics, 1966, 8, 281-304.

Leslie, L. Methods of teaching Gregg shorthand. New York: McGraw-Hill, 1953.

Lindsay, V. J. Psychological concepts germane to efficient motor skill development in typewriting. Doctoral dissertation, Indiana University, 1966. University Microfilms No. 67-4019.

Lusk, N. M. A study of the comparison between construction of shorthand outlines according to theory and the accuracy of transcription. Unpublished master's thesis, University of Washington, 1959.

Mason, R. An analysis of related instruction for cooperative part-time programs in distributive education in Illinois. Doctoral dissertation, University of Illinois, 1962. University Microfilms No. 62,647.

Martin, A. Predicting keyboard trainability. Occupational Psychology, 1956, 30, 216-227.

McKenna, M. A. Effect of early introduction of new-matter dictation in the teaching of beginning shorthand to college students. Doctoral dissertation, Michigan State University, 1966. University Microfilms No. 67-1656.

McLean, G. N. Difficulty indices and performance standards for office-typing tasks. City University of New York (Division of Teacher Education). Research Report 71-2, January 1971. [Project 8-B-113, U. S. Office of Education].

Muhich, D. M. Key-stroking vs. decision-making factors in proficiency at office-typing tasks. Unpublished master's thesis, Southern Illinois University (Carbondale), 1967.

National Business Education Quarterly. Washington, D. C.: National Business Education Association.

Persing, B. S. A classroom investigation of when to begin new-matter dictation in Gregg shorthand. Doctoral dissertation, University of Oklahoma, 1966. University Microfilms No. 66-14,240.

Pickle, H. B. An inquiry into the characteristics of successful small business managers. Doctoral dissertation, University of Arkansas, 1964. University Microfilms No. 64-10,073.

Pierson, F. C. and Others. The education of American businessmen. New York: McGraw-Hill, 1959.

Porter, S. Typewriter boom. New York Post Magazine, June 22, 1966. p. 2.

Prewitt, L. B. A comprehensive analysis, classification, and synthesis of research findings and thought in the area of office practice instruction, 1951-59. Doctoral dissertation, Indiana University, 1961. University Microfilms No. 61-3221.

Price, R. G., & Hopkins, C. R. Review and synthesis of research in business and office education. (2nd ed.) Columbus, O.: ERIC Clearinghouse on Vocational and Technical Education, Ohio State University, 1970.

Prince, D. J. An experiment comparing the achievement in transcription of students when the 500 most used words were emphasized with the achievement of students when these words were not emphasized in beginning shorthand. Unpublished master's thesis, University of Maryland, 1967.

Pullis, J. M. The relationship between competency in shorthand accuracy and achievement in shorthand dictation. Doctoral dissertation, North Texas State University, 1966. University Microfilms No. 66-10,953.

Rahe, H. C. Typewriting research index. New York: McGraw-Hill, 1963.

Rahe, H. C. Shorthand-secretarial research index. New York: McGraw-Hill, 1965.

Robinson, J. W. The relation of copy difficulty to typewriting performance. Delta Pi Epsilon Journal, 1967, 9(2), 9-24. (a)

Robinson, J. W. (Ed.) Practices and preferences in teaching typewriting. Monograph 117. Cincinnati: South-Western Publishing Co., 1967, (b)

Russon, A. R. Methods of teaching shorthand. Monograph 119. Cincinnati: South-Western Publishing Co., 1968.

Silverthorn, J. E. The basic vocabulary of written business communication. Doctoral dissertation, Indiana University, 1955. University Microfilms No. 55-386.

Sluder, L. I. An analysis and synthesis of research findings pertaining to general business. Doctoral dissertation, Indiana University, 1965. University Microfilms No. 65-14,070.

Smith, E. R. A comparison of the learning difficulty of Forkner alphabet shorthand and Gregg shorthand. Doctoral dissertation, Ohio State University, 1967. University Microfilms No. 67-2540.

Spanswick, R. S. An investigation to determine the qualifications and skills desired, accepted, and actually used in manual bookkeping jobs which were listed in Chicago and New York City newspapers during the months of May and August, 1966. Doctoral dissertation, Northern Illinois University, 1967. University Microfilms No. 68-1120.

Stolurow, L. M. The psychology of skills--Part II: Analysis and implications. Delta Pi Epsilon Journal, 1959, 2(3), 16-31.

Super, D. E., & Crites, J. O. Appraising vocational fitness. (Rev. ed.) New York: Harper & Row, 1962.

Temple, P. A comparison of two methods of teaching typewriting. Unpublished master's thesis, University of Minnesota, 1963.

Uthe, E. An evaluation of the difficulty level of shorthand dictation material. Doctoral dissertation, University of Minnesota, 1967. University Microfilms No. 67-11,107.

Wallen, N. E., & Travers, R. M. W. Investigation and analysis of teaching methods. In N. L. Gage (Ed.), Handbook of research on teaching. Chicago: Rand McNally, 1963. Pp. 448-505.

Wanous, S. Transcription standards in business correspondence. Unpublished doctoral dissertation, University of Pittsburgh, 1940.

Weber, Warren C. A Q-sort of curriculum priorities in secretarial education. Doctoral dissertation, Arizona State University, 1969. University Microfilms No. 69-12,567.

West, L. J. The acquisition of stenographic skill: A psychological analysis. Business Education Forum, 1963, 18(1), 7-8.

West, L. J. Vision and kinesthesis in the acquisition of typewriting skill. Journal of Applied Psychology, 1967, 51, 161-166.

West, L. J. The vocabulary of instructional materials for typing and stenographic training--research findings and implications. Delta Pi Epsilon Journal, 1968, 10(3), 13-25.

West. L. J. Acquisition of typewriting skills. New York: Pitman, 1969. (a)

West, L. J. Business education. In R. L. Ebel (Ed.), Encyclopedia of educational research. (4th ed.) London, England: Macmillan, 1969. (b)

West, L. J., & McLean, G. N. Evaluation of error-cutoff scoring in straight copy typewriting tests. Business Education Forum, 1968, 23(2), 10-12.

Wise, E. L. A comparative study of the materials typed by beginning typists in representative business offices of metropolitan Denver, Colorado, with production materials contained in selected high school typewriting textbooks including the development of a scale of difficulty for typing similarly constructed materials in different forms. (Doctoral dissertation, University of Colorado, 1968. University Microfilms No. 68-14,409.

Wright, G. S. Subject offerings and enrollments in public secondary schools. USOE, OE-24015-61. Washington, D. C.: Government Printing Office, 1965.